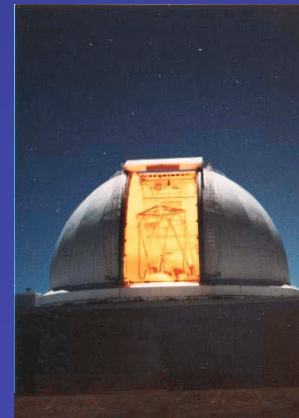


Exoplanet Spectroscopy

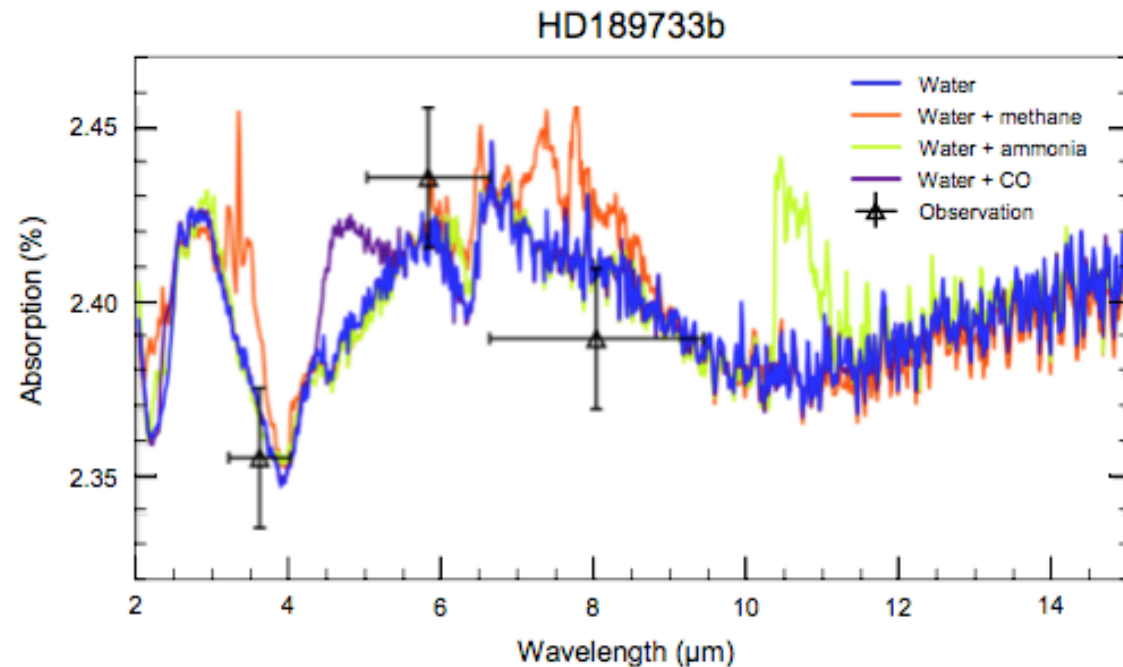
Mark Swain



Spectroscopy:

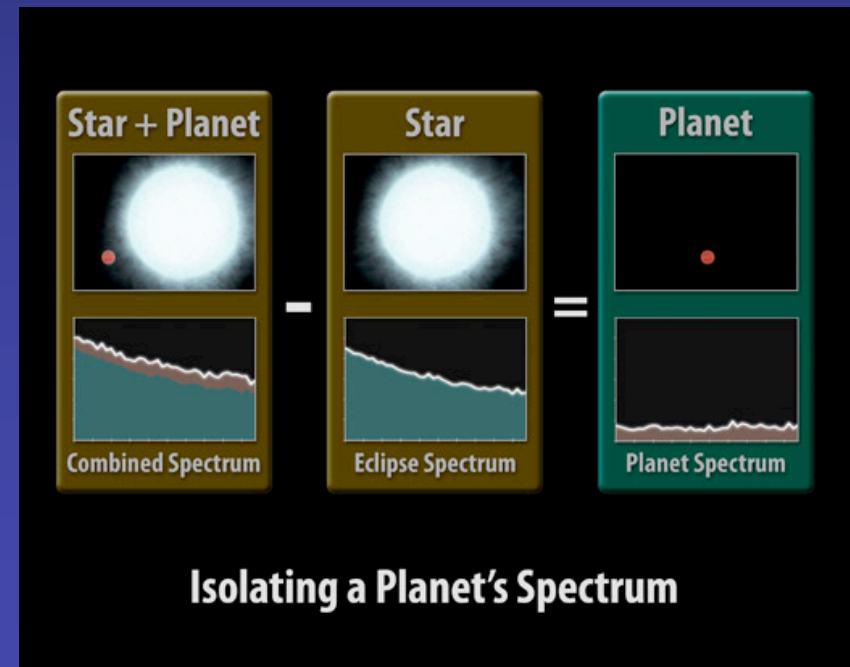
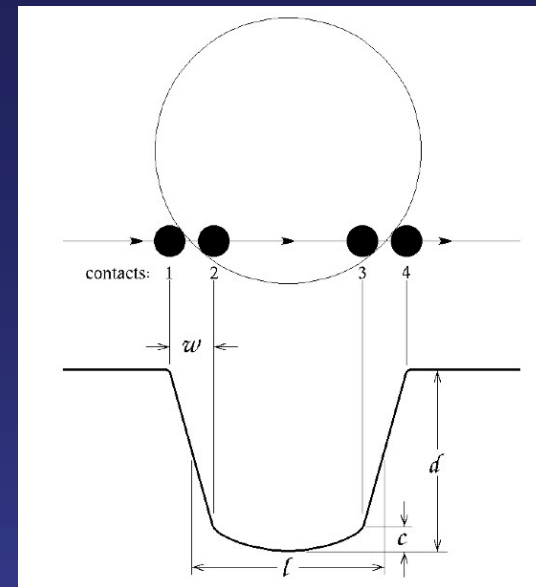
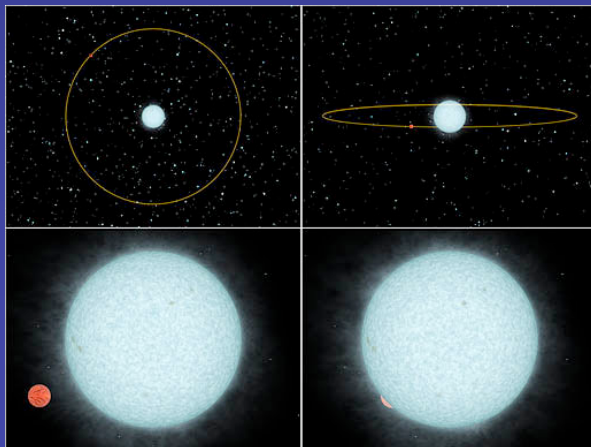
using molecules as probes

- **Conditions** (T profile, inversion, haze)
- **Composition** (H_2O , CH_4 , CO , CO_2 , NH_4)
- **Chemistry** (photo vs thermo, non-equilibrium)
- **Dynamics** (abundance localization, heat redistribution)



Transiting planets: *something special*

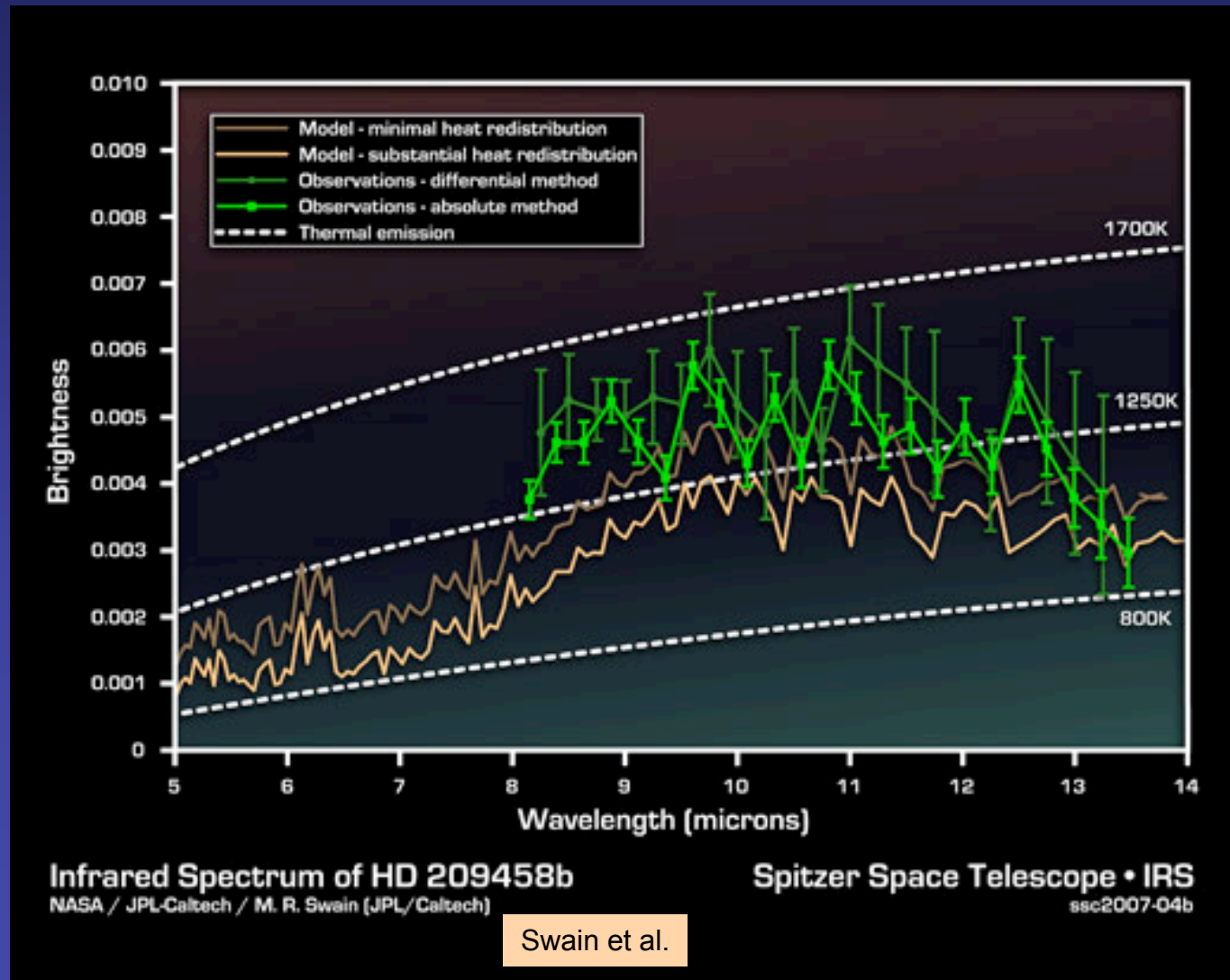
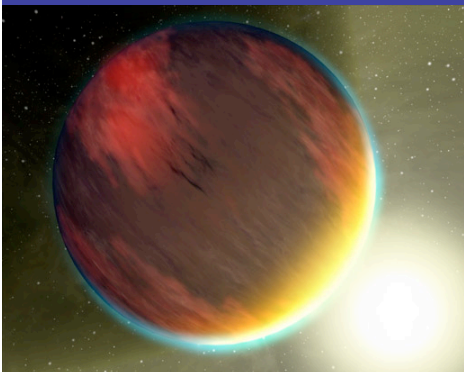
- Primary eclipse
 - Blocks starlight
 - Starlight filters through planet atmosphere
- Secondary eclipse
 - Light from planet blocked
- Both detected by measuring intensity as a function of time



Emission spectra of 189 & 209 mid-IR



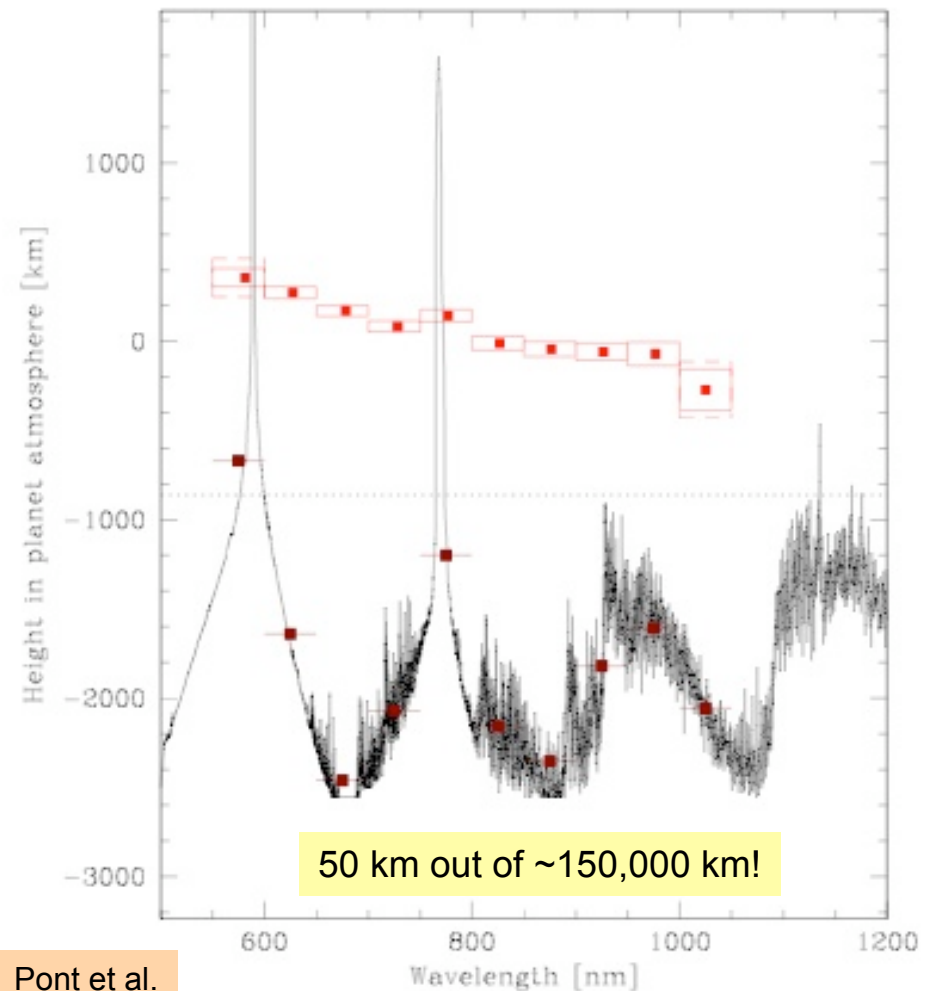
Where is the water?
Not present?
Hidden by T profile?
Hidden by clouds?



Haze on HD 189733b

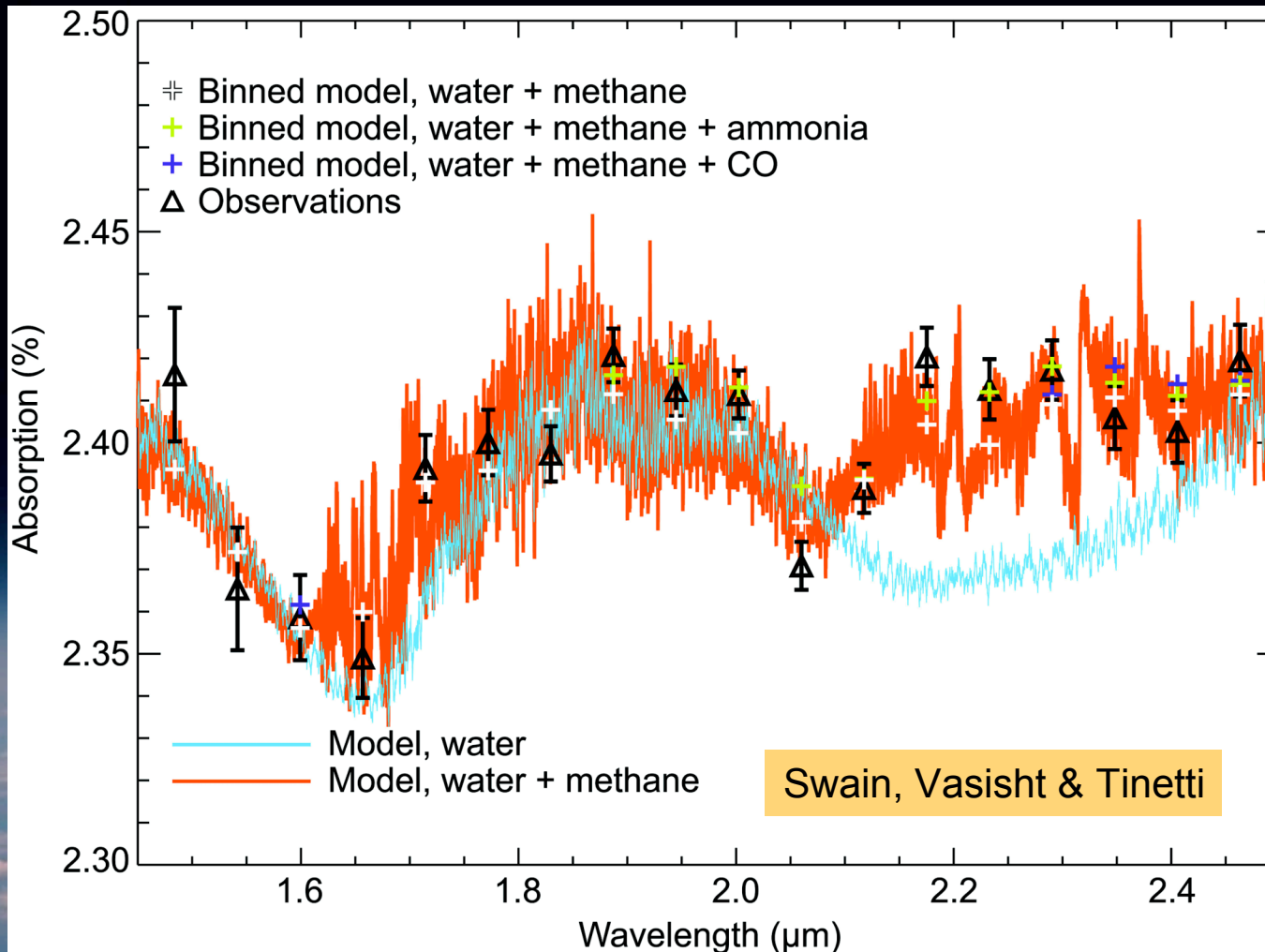
visible

- Best SNR to date
- Small particles at high altitude
- Incredibly precise diameter

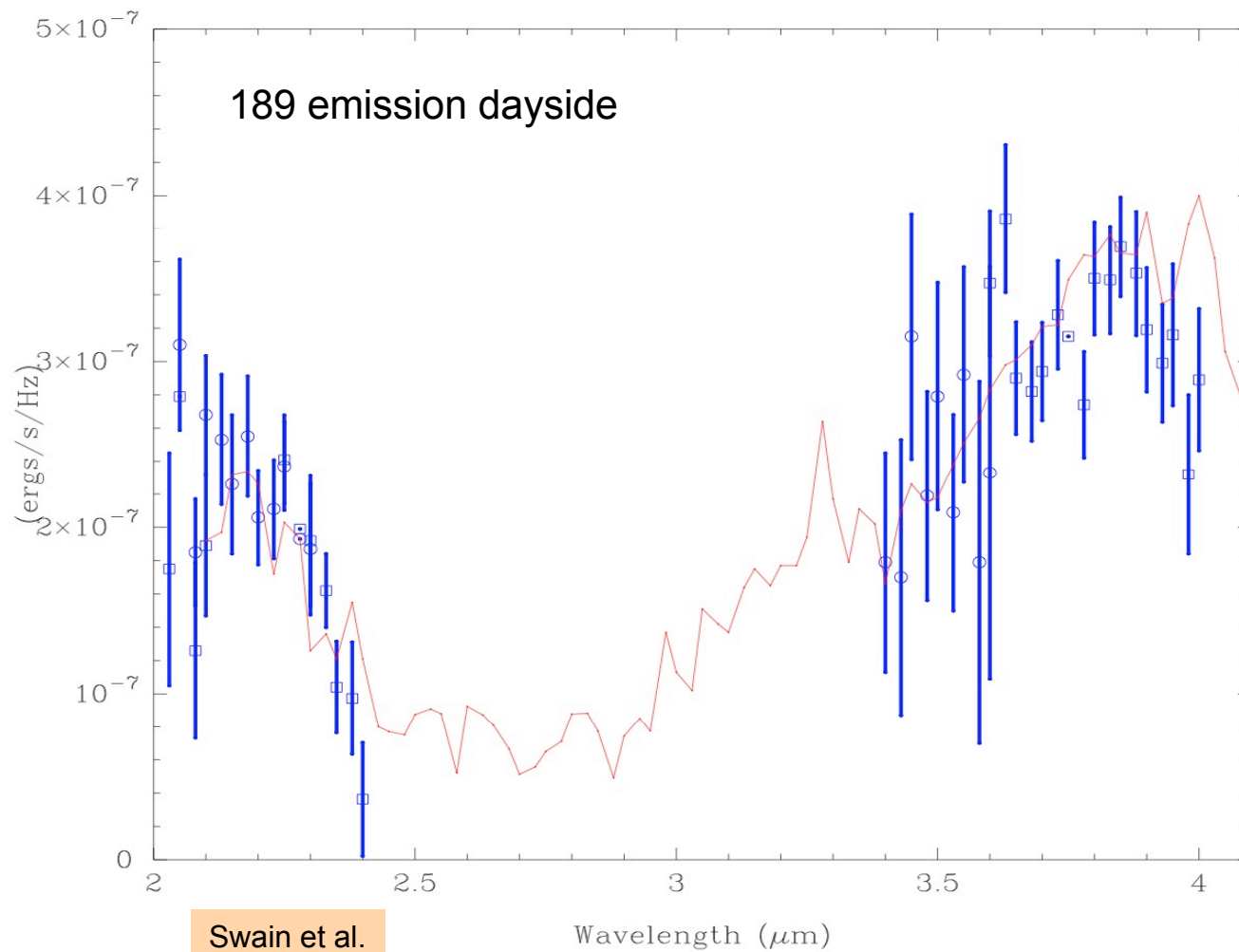


Pont et al.

Methane detected in an exoplanet atmosphere



IRTF emission spectrum



Spitzer calibration implications:

Spectroscopy of non-transiting planets is possible!

